IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application	:	Steven Joseph King
Serial No.	:	10/081,127
Filed	:	February 22, 2002
For	:	METHOD AND SYSTEM FOR IMPROVING ABILITY OF A MACHINE VISION SYSTEM TO DISCRIMINATE FEATURES OF A TARGET
Attorney's Docket	:	ACUITY-029XX
Examiner	:	Seth, Manav
Group Art Unit	:	2624

APPEAL BRIEF

Mail Stop Appeal
Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Attention: Board of Patent Appeals and Interferences

The following brief is submitted in connection with an appeal taken in the above-identified application, subsequent to the Notice of Appeal filed on January 31, 2007. This brief is accompanied by the fee set forth in 37 CFR 1.17(c).

REAL PARTY IN INTEREST

Applicants respectfully submit that the real party in interest of the above-identified patent application is Siemens Energy and Automation, Inc. with a principal place of business at 170 Wood Avenue South, Iselin, New Jersey, 08830, as per the assignment, which was recorded on November 17, 2005, Reel 016794, Frame 0078.

RELATED APPEALS AND INTERFERENCES

It is respectfully submitted that there are no other appeals or interferences known to Appellant, the Appellant's legal representative, or Assignee, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

STATUS OF CLAIMS

Claims 15-16, 18, 19 and 21-29 are pending. Claims 15-16, 18, 19 and 21-29 are being appealed. Claims 5, 8, 17, and 20 have been previously cancelled. Claims 1-4, 6, 7, and 9-14 are canceled pursuant to §41.33. Claims 15-16, 18, 19 and 21-29 have been rejected.

Specifically, claims 15-16, 18, 21, 23-24, 28, and 29 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Takeuchi et al., U.S. Patent No. 6,337,767 (hereinafter Takeuchi), in further view of Kley, U.S. Patent No. 4,806,776 (hereinafter Kley), in further view of Kubisiak et al., U.S. Patent No. 3,710,128 (hereinafter Kubisiak).

Specifically, claims 15, 28, and 29 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Takeuchi et al., U.S. Patent No. 6,337,767, in further view of Kley, U.S. Patent No. 4,806,776, in further view of Ausschnitt et al., U.S. Patent No. 5,914,784 (hereinafter Ausschnitt).

Specifically, claims 19 and 27 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Takeuchi et al., U.S. Patent No. 6,337,767, in further view of Kley, U.S. Patent No. 4,806,776, in further view of Kubisiak et al., U.S. Patent No.

3,710,128, in further view of printed article from Archive.org, "Nerlite DOAL and COAL Illuminators" (2000) (hereinafter Archive).

Specifically, claim 22 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Takeuchi et al., U.S. Patent No. 6,337,767, in further view of Kley, U.S. Patent No. 4,806,776, in further view of Kubisiak et al., U.S. Patent No. 3,710,128, in further view of Murnaghan Instruments, "UV35 Ultraviolet Passing - Visible Blocking CCD filter" (1999) (hereinafter Murnaghan).

Specifically, claims 25-26 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Takeuchi et al. U.S., Patent No. 6,337,767, in further view of Kley, U.S. Patent No. 4,806,776, in further view of Kubisiak et al., U.S. Patent No. 3,710,128, in further view of Schneider Optics "Filters for Motion pictures and television" (1999) (hereinafter Schneider).

STATUS OF AMENDMENTS

Claims 15, 27, 28, and 29 had been amended on January 31, 2006 and the amendments were entered.

Claims 5, 8, 17, 20 had been cancelled on January 31, 2006. These cancellations have been entered.

Claim 21 has been amended on July 12, 2006 to correct dependency issues due to prior cancellation of claim. This amendment was not entered.

Claims 1-4, 6, 7, and 9-14 are canceled pursuant to §41.33.

SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates to machine vision systems and more particularly, to a system and method for inspecting and

locating objects on the surface of a Printed Circuit Board (PCB) substrate. In one example, integrated circuits on the PCB are placed in a JEDEC tray for examination under a machine vision inspection system. It is of interest to discern the relative location of connection pads on the integrated circuit with respect to the edges of the integrated circuit packages. Thus, it is important to be able to discriminate the pads from the edges of the package.

In order to be able to discriminate the pads from the edges of the package, the reflected illumination off the pads should be clearly distinguishable from the package edges and background. In many cases, the reflectance of the pads and edges are too similar to be able to clearly and automatically distinguish and differentiate the two. In other applications, the reflected light from the pads is so great as to cause bloom in the video camera and obscure the edges.

The machine vision method and system, in its various aspects and embodiments, includes a camera connected to a computer, for processing of visual information about a target seen by the camera. The target is illuminated by a conventional light source and an ultraviolet light source with images collected under each lighting condition. The multiple images may be compared and combined to extract information about the target. The ultra-violet

light source may be filtered to block visible light, and the camera's field of view may be filtered so as to block ultraviolet light.

According to claim 15, a camera 12 has field of view of one or more targets 22 supported by a platform 24. The platform 24 may include a moving conveyor belt or an adjustable tray. The target 22 may contain one or more objects 42 each having details of interest. See paragraph [0018].

The field of view 18 of the camera 12 may be illuminated by a conventional light source 24 such as a low angle diffuse light source possibly made up of multiple off axis LED's is shown, as well as a high angle ultraviolet light source 26. See paragraph [0019]. A computer 14 receives an image from the camera 12. See paragraph [0017]. The camera 12 is capable of taking a first image of a target 22 illuminated by at least the first illumination source 24, and further capable of taking a second

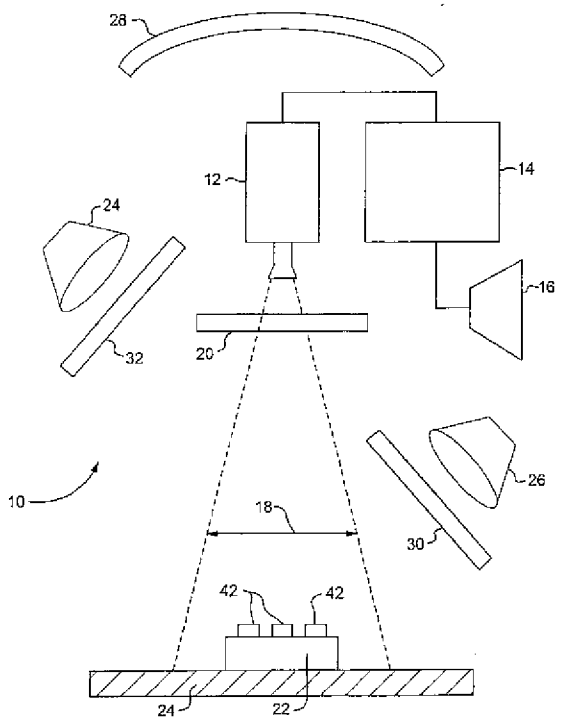

FIG. 1

image of the target 22 illuminated by at least the second illumination source 26. The first and second images are analyzed in the computer 14 to determine an edge of at least a portion of the target 22. See paragraph [0021].

According to claim 27, an exemplary method provides a camera 12 connected to a computer 14 having storage, an input to receive at least first and second images and an output providing extracted image information. The method provides a filter 20 disposed between the camera 12 and the target 22 in which the filter 20 blocks ultraviolet light. See paragraph [0018]. The camera 12 obtains a first image of the target 22 and sends the image to the computer 12 while the target 22 is illuminated by a first visible spectrum illumination source 24 comprising a diffuse on-axis light. The camera 12 obtains a second image of the target 22 and sends the image to the computer 14 while the target 22 is illuminated by at least a second illumination source 26 comprising an ultraviolet light. The computer 14 analyzes the first and second images to extract information about the target to determine an edge of at least a portion of the target.

According to claim 28, an exemplary method provides a camera 12 connected to a computer 14 having storage, an input to receive at least a first image, a second image, and an output providing extracted image information. See paragraph [0021]. A visible

light filter 20 is disposed between the camera 12 and the target 22, which visible light filter blocks visible light. An ultraviolet light filter 20 is disposed between the camera 12 and the target 22, which ultraviolet light filter blocks ultraviolet light. See paragraph [0018]. The camera 12 obtains a first image of the target 22 and sends the image to the computer 12 while the target 22 is illuminated by a first visible spectrum illumination source 24 comprising a diffuse on-axis light. The camera 12 obtains a second image of the target 22 and sends the image to the computer 14 while the target 22 is illuminated by at least a second illumination source 26 comprising an ultraviolet light. The computer 14 analyzes the first and second images to extract information about the target to determine an edge of at least a portion of the target.

According to claim 29, an exemplary system provides a camera 12 with a first target 22 illumination source 24 comprising a visible light source and a second target 26 illumination source comprising an ultra-violet light source. A filter 30 is disposed between the camera 12 and the target 22. A computer 14 is connected to the camera 12. The computer 14 receives an image from the camera 14. See paragraph [0017]. The camera is capable of taking at least the first image of said target illuminated by said ultraviolet light source 26 and the second image of said

target illuminated by said visible light source 24, and the first image and second image are able to be analyzed in the computer to extract dimensional information about the target. See paragraph [0021].

Grounds of rejection to be reviewed on appeal

Claims 15-16, 18, 21, 23-24, 28, and 29 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Takeuchi et al., U.S. Patent No. 6,337,767 (hereinafter Takeuchi), in further view of Kley, U.S. Patent No. 4,806,776 (hereinafter Kley), in further view of Kubisiak et al., U.S. Patent No. 3,710,128 (hereinafter Kubisiak).

Regarding claims 15 and 16, Takeuchi is cited as disclosing illuminating a target (specimen) with at least a first visible light spectrum illumination source, taking a first image of the target using an image recording device, illuminating the target with at least a second ultraviolet illumination source, taking at least a second image of the target using said image recording device (col. 7, lines 20-30; col. 8, lines 1-36, images generated from the electrical signals for observation of the specimen (target) on the monitor (col.8, lines 24-25)). Takeuchi is cited for teaching taking images under different frequencies of light and then observing the specimen in the images on the monitor but does not expressly teach of processing said first image and at least a second image using a data processing device and extracting information of interest about the target.

Kley is cited for disclosing the processing a first and at least a second image using a data processing device and extracting

information of interest (col. 37, lines 22-60; figures 81-100; col. 38, lines 47-60). A variation illustrated in figure 83 is cited for disclosing a computer 1376 samples and processes the video signal from the television camera 1340 and displays processed video signals on monitor 1358. The computer 1376 is programmed to form differential images by digital techniques from successive frames of the video signal from television camera 1340. One particular application of the electronic illumination control employing oblique light units 1352 and 1354 to illuminate an object such as a printed circuit board 1378 is cited as shown in fig. 84. The use of alternate light units wherein at least one of the units is oblique, produces differential images which contain information regarding the height of the structures of the object in addition to the normal two-dimensional information concerning width and length of structure in the object being viewed. It is then argued that it would have been obvious for one of ordinary skill in the art at the time of invention was made to combine the teachings of Takeuchi and Kley based on the interpretation that both references are directed to the object (or target) observation under different light sources of different frequencies and both Takeuchi and Kley teaches the use of microscope to observe the specimen (or target). Kley is further cited for disclosing illuminating the object (target) using different frequencies of illumination sources and utilizing the reflected illumination to determine the identity of a property (dimensional information, as discussed before) of the object (col. 42, lines 56-68). It is argued that therefore providing the versatile usage of using light sources of different frequencies in the inspection of object's properties and that Kley's invention provides the possible versatile use (application) of the teachings provided by Takeuchi.

It is argued that Kley determines width and length of the object, which identify the edges of the object.

Kubisiak is cited for disclosing determining an edge of the object from the image signals where the object being illuminated using two different light sources (col. 9, lines 59-68 through col. 10, lines 1-16; col. 2, lines 47-55; col. 3, lines 35-65; col. 4, lines 43-68 through col. 5, lines 1-40). It is argued that it would have been obvious for one of ordinary skill in the art at the time of invention to use Kubisiak's teachings in the combined invention of Takeuchi and Kley because the references are directed to measuring the dimensions of the object under different illumination sources and Kubisiak's method of determining edge of the object would provide a better accuracy (See Kubisiak, col. 2, lines 35-46).

Claim 18 recites the method of claim 15 wherein analyzing said first and at least a second image comprises superpositioning of the first image and the second image. Kubisiak is cited for disclosing superpostioning of the two image signals (col. 4, lines 43-68 through col. 5, lines 1-40).

Regarding claim 21, Takeuchi is cited for disclosing the act of providing a filter disposed between the target and the at least a second illumination source to block visible light. (Figure 5; col. 8, lines 11-13, "under ultraviolet ray observation with DUV light, the illumination light becomes only ultraviolet light by UV filter 151").

Claims 23-24 recite the method of claim 15 further comprising the act of providing a filter disposed between the camera and the target and specifically an ultraviolet filter. Kley is cited for disclosing in alternative embodiments the color control unit 1446 can have arguably additional frequency band pass filters, or can

have band pass filters for non-visible frequencies such as infrared or ultraviolet light where the camera 1340 is sensitive to such radiations (col. 39, lines 22-30). The instant invention recites the use of band pass filters to block a particular spectrum of light, not the design of these band pass filters. It is argued therefore the use of band pass filters are very well known to be used in front of cameras and light sources to block a particular spectrum of frequencies and it depends on user's specific design choice of selecting the band pass filter depending on what frequency band to be blocked and what needs to be passed on. Figures 2 and 5 of Takeuchi are also cited.

Regarding claim 28, Takeuchi is cited for teaching a filter which blocks visible light, and a filter which blocks ultraviolet light disposed between the imaging device and target (col. 3, lines 25-35; col. 8, lines 1-26). All other limitations of claim 28 were similarly analyzed and rejected as per claim 15.

Claim 29 was similarly analyzed and rejected as per claims 15, 16 and 23-24.

Claims 15, 28, and 29 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Takeuchi et al., U.S. Patent No. 6,337,767, in further view of Kley, U.S. Patent No. 4,806,776, in further view of Ausschnitt et al., U.S. Patent No. 5,914,784 (hereinafter Ausschnitt). Takeuchi discloses illuminating a target (specimen) with at least a first visible light spectrum illumination source, taking a first image of the target using an image recording device, illuminating the target with at least a second ultraviolet illumination source, taking at least a second image of the target using said image recording device(col. 7, lines 20-30; col. 8, lines 1-36, images generated from the electrical signals for observation of the specimen (target) on the

monitor (col.8, lines 24-25)). Takeuchi does teach taking images under different frequencies of light and then observing the specimen in the images on the monitor but does not expressly teach of processing said first image and at least a second image using a data processing device and extracting information of interest about the target.

Kley is cited for disclosing processing a first and at least a second image using a data processing device and extracting information of interest (col. 37, lines 22-60; figures 81-100; col. 38, lines 47-60; In a variation illustrated in figure 83, a computer 1376 samples and processes the video signal from the television camera 1340 and displays processed video signals on monitor 1358. The computer 1376 is programmed to form differential images by digital techniques from successive frames of the video signal from television camera 1340. One particular application of the electronic illumination control employing oblique light units 1352 and 1354 to illuminate an object such as a printed circuit board 1378 is cited as shown in fig. 84. The use of alternate light units wherein at least one of the units is oblique, produces differential images which contain information regarding the height of the structures of the object in addition to the normal two-dimensional information concerning width and length of structure in the object being viewed). It is argued that therefore, it would have been obvious for one of ordinary skill in the art at the time of invention was made to combine the teachings of Takeuchi and Kley because both references are directed to the object (or target) observation under different light sources of different frequencies and both Takeuchi and Kley are cited as teaching the use of microscope to observe the specimen (or target) and Kley is further cited providing the more versatility by teaching "that all

of the variations and modifications of illumination control in connection with a microscope are also applicable to video systems or systems wherein an electronic signal is generated indicative of the object being viewed (col. 36, lines 20-28). Kley is further cited as disclosing illuminating the object (target) using different frequencies of illumination sources and utilizing the reflected illumination to determine the identity of a property (dimensional information, as discussed before) of the object (col. 42, lines 56-68) where light sources of different frequencies, therefore providing the versatile usage of using light sources of different frequencies in the inspection of object's properties and Kley's invention is cited as providing the possible versatile use (application) of the teachings provided by Takeuchi. As discussed above the combined invention of Takeuchi and Kley discloses determining the dimensional information of the object from the information extracted from the object images but does not expressly teach "comprising the determination of an edge of at least a portion of the target. Kley is cited as determining the width and length of the object and which as arguably the parameters totally identify the edges of the object.

Ausschnitt is cited as disclosing "determination of the location of the object edge may include comparing the image signal profiles of the object edge at the different phases or different light colors" (col. 3, lines 47-50) where different color light belong to different light frequencies. It is argued that it would have been obvious for one of ordinary skill in the art at the time invention was made to use Ausschnitt's cited teachings in the combined invention of Takeuchi and Kley because the references teach evaluation of the object under different lighting conditions. Kley is cited as teaching measuring the dimensions of

the object and Ausschnitt's is cited as teaching to further provide the improved method of detecting and measuring edges of features which would produce sharper edges (See Ausschnitt, col. 3, lines 2-6).

Claims 19 and 27 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Takeuchi et al., U.S. Patent No. 6,337,767, in further view of Kley, U.S. Patent No. 4,806,776, in further view of Kubisiak et al., U.S. Patent No. 3,710,128, in further view of printed article from Archive.org, "Nerlite DOAL and COAL Illuminators" (2000) (hereinafter Archive). Claim 19 recites "the first illumination source comprises using a diffuse on-axis light source". As discussed in the rejection of claim 15, Kley is cited as suggesting using different kinds of light sources and examiner further asserts that "diffuse on-axis light source" (DOAL) is very well-known to be used for illumination purposes. Examiner took official notice for this light source and here by provides the reference (Nerlite from archive.org) which further provides motivations to use DOAL, by teaching "With the DOAL's illumination, light rays reflect off a beam splitter on to an object at nearly 90 degrees and further providing uniform light output eliminating glare and shadows and this provides standard use of DOAL in applications that involve the inspection of objects with reflective surfaces" (Nerlite, pages 1-3). Therefore, in view of the above cited advantages of DOAL with respect to reference Nerlite, it would have been obvious for one of ordinary skill in the art at the time of invention was made to use DOAL in the combined invention of Takeuchi, Kley and Kubisiak.

Claim 27 was similarly analyzed and rejected as per claims 15, 16 and 19.

Claim 22 has been rejected under 35 U.S.C. § 103(a) as being

unpatentable over Takeuchi et al., U.S. Patent No. 6,337,767, in further view of Kley, U.S. Patent No. 4,806,776, in further view of Kubisiak et al., U.S. Patent No. 3,710,128, in further view of Murnaghan Instruments, "UV35 Ultraviolet Passing - Visible Blocking CCD filter" (1999) (hereinafter Murnaghan).

Claim 22 recites "the method of claim 21 wherein the filter blocks wavelengths of lights greater than 390 nanometers". Kley does not teach a filter that blocks wavelengths of light greater accuracy of images. Schneider is cited for teaching such an ultraviolet blocking filter UV -410 which filters out ultraviolet light below 410nm (page 20, lower right hand corner). Therefore, it is argued that it would have been obvious for one of ordinary skill in the art to use Schneider's ultraviolet filter in the invention of Kley as Schneider's filter would filter out ultraviolet light below 410 nm, blocks the blue cast, penetrates haze and permits to capture vivid colors and shaper detail.

Specifically, claims 25-26 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Takeuchi et al. U.S., Patent No. 6,337,767, in further view of Kley, U.S. Patent No. 4,806,776, in further view of Kubisiak et al., U.S. Patent No. 3,710,128, in further view of Schneider Optics "Filters for Motion pictures and television" (1999) (hereinafter Schneider).

Claim 25-26 recites "the method of claim 15 wherein the filter blocks light less than 410 nanometers". Takeuchi and Kley are cited as teaching blocking ultraviolet light but do not specifically teach blocking light less than 410 nanometers. It is argued that it is well known that ultraviolet light and visible light are part of the light spectrum where ultraviolet light range starts from 400nm and goes lower and visible light range starts at 400nm to 700nm. The violet color in the visible range is argued as

laying at the intersection of 400nm and practically between 390nm and 410nm such that violet being a part of ultraviolet as well as visible range. Therefore, it is argued that inventors have been using band pass after that completely blocks ultraviolet light which is less than 410 nanometers where specifically and completely blocking only visible light which is greater than 390nm where specifically ultraviolet based imaging is required, for better accuracy of images. Schneider is further cited as teaching such an ultraviolet blocking filter UV -410 which filters out ultraviolet light below 410nm (page 20, lower right hand corner). Therefore, it is argued that it would have been obvious for one of ordinary skill in the art to use Schneider's ultraviolet filter in the invention of Kley as Schneider's filter would filter out ultraviolet light below 410 nm, blocks the blue cast, penetrates haze and permits to capture vivid colors and shaper detail.

ARGUMENTS

A. Claims 15-16, 18, 19, 21, 23-24, and 27-29 are patentably distinguishable over the Takeuchi and (Kley and Kubisiak) or (Kley and Ausschnitt)

Applicant urges that the Examination lacks the evidence, facts, or findings sufficient to establish a *prima facie* case of obviousness. To establish a *prima facie* basis for obviousness, the Office bears the burden to show the factual basis of the rejection. In re Warner, 379 F.2d 1011, 389 U.S. 1057 (1968).

To meet this burden the Office must show that the references are analogous and would have been relied upon by an individual skilled in the art at the time of the invention. The Office must

also provide a specific motivation to combine references, and to support the *motivation* for each combination, as well as the substance behind each rejection, with factual references. However, the art relied upon by the Office is non-analogous and the Office's reasoning ignores the great many teachings within the references that tend to demonstrate that the references are *not* combinable, and also ignores the lack of indicia that would lead one to combine the references to obtain the invention. These reasons, expounded upon below, create a compelling and legally sufficient basis to demonstrate that a *prima facie* basis for a rejection does not exist.

There must be a basis in the art for combining or modifying references. MPEP § 2143.01 provides:

> The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills,* 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).

The CCPA expressly held that there must be some logical reason apparent from the evidence of record that would justify a combination or modification of references. *In re Regel*, 188USPQ 132 (CCPA 1975). In determining whether one of ordinary skill in the art would find it obvious to modify or combine references, the teachings of the reference taken with the knowledge that a worker in the art already possesses constitute the scope and content of

the prior art that is referred to in the *Graham* decision. Thus, the question raised under § 103 is whether the prior art taken as a whole would suggest the claimed invention taken as a whole to one of ordinary skill in the art. Accordingly, *even if all elements of a claim are disclosed in various prior art references, the claimed invention taken as a whole cannot be said to be obvious without some reason given in the prior art why one of ordinary skill would have been prompted to combine the teachings of the references to arrive at the claimed invention. In re Regel, supra*. Where no reasonable intrinsic or extrinsic justification exists for the proposed combination or modification, *prima facie* obviousness will not have been established, and no such justifications exist between Takeuchi and (Kley and Kubisiak) or (Kley and Ausschnitt), thus, no *prima facie* case of obviousness has been established. These principles are applied in more detail, below.

The Federal Circuit has also repeatedly warned against using the Applicant's disclosure as a blueprint to reconstruct the claimed invention out of isolated teachings in the prior art. *See, e.g., Grain Processing Corp. v. American Maize-Products*, 840 F2d. 902, 907, 5 USPQ2d 1788, 1792 (Fed. Cir. 1988). The black letter law statements by Judge Linn in *In re Kotzab*, 217 F.3d 1365, 55 USPQ2d 1313 (Fed. Cir. 2000) address this subject, *viz*:

a) Hindsight

A critical step in analyzing the patentability of claims pursuant to section 103(a) is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field. Close adherence to this methodology is especially important in cases where the very ease with which the invention can be understood may prompt one "to fall victim to the insidious effect taught is used against the teacher." (*Id.* At 1369, 55 USPQ2d at 1316).

b) Need for Motivation

Most if not all inventions arise from a combination of old elements. Thus, every element of a claimed invention may often be found in the prior art. *See id.* However, identification in the prior art of each individual part claimed is insufficient to defeat patentability of the whole claimed invention. *See id.* Rather, to establish obviousness based on a combination of the elements disclosed in the prior art, there must be some motivation, suggestion or teaching of the desirability of making the specific combination that was made by the applicant. (*Id.* at 1369, 55 USPQ2d at 1316).

c) Particular Findings Required

The motivation, suggestion or teaching may come explicitly from statements in the prior art, the knowledge of one of ordinary skill in the art, or, in some cases the nature of the problem to be solved. In addition, the teaching, motivation or suggestion may be implicit from the prior art as a whole, rather than expressly stated in the references. The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved, as a whole would have suggested to those of ordinary skill in the art. Whether the Board relies on an express or an implicit showing, it must provide particular findings related thereto. Broad conclusory statements standing alone are not "evidence." (*Id.* at 1370, 55 USPQ2d 1317).

Applicant's invention is directed towards a machine vision system used to identify integrated circuit boards and their components in an automated vision system. The system is used to identify and determine the location of the integrated circuit boards while distinguishing between the edges and other components of the integrated circuit boards.

The rejection relies on Takeuchi and incorporates by reference Kita for the teaching of illuminating a target with at

least a first visible light spectrum illumination source, taking a first image of the target using an image recording device, illuminating the target with at least a second ultraviolet illumination source, and taking at least a second image of the target using said image recording device. However, the Office ignores the defect in reason as to why one skilled in the art of machine vision systems at the time of the invention would have relied on teachings associated with an ultraviolet microscope.

Takeuchi and Kita are focused on obtaining higher resolution than visible light using an electronic microscope at the ultraviolet frequencies to observe microstructures. Applicant's machine vision system is not directed towards observing microstructure detail. The Office provides no reason as to why one skilled in the art of machine vision systems, who is not attempting to observe microstructures, would look to the teachings of an electronic microscope designed for higher resolution of microstructures than that achievable by a traditional visible light microscope.

The Office alleges that the combination of Takeuchi with (Kley and Kubisiak) or (Kley and Ausschnitt) is proper because in Kley "the object observation is under different light sources of different frequencies." Presumably Kley would want to use Takeuchi to observe at ultraviolet frequencies. However, this is

clearly erroneous. Kley is directed to the visible spectrum. Kley discloses that different colors of illumination may be used; however, this teaching is limited to different illumination sources within the visible spectrum. Kley provides no suggestion of using ultraviolet light. Kley only provides specific examples of using select visible colors to contrast the visible colors of an object's surface. See 42, lines 57-70 of Kley. In addition, the Office Action has not refuted that Kley discloses a bandpass filter for ultraviolet light placed in front of a camera to remove ultraviolet light for cameras sensitive to ultraviolet light in order to prevent unwanted noise. Kley actually teaches away from the Office Action's assertion. An individual skilled in the art at the time of the invention would not be motivated by the teaching of Takeuchi due to Kley suggesting a desire to remove unwanted ultraviolet light. The Examination simply fabricates out of whole cloth the idea of illuminating with ultraviolet light (*Takeuchi*) combined with using visible light to identify object edges (*Kley*), even though neither reference suggests nor identifies such a problem. This is classic hindsight reasoning of exactly the type warned of above by Judge Linn.

The Office has broken Applicant's invention into two parts using hindsight: Part A directed toward illuminating a target with at least a first visible light spectrum illumination source,

taking a first image of the target using an image recording device, illuminating the target with at least a second ultraviolet illumination source, and taking at least a second image of the target using said image recording device; and Part B directed towards processing said first and at least a second image using a data processing device and extracting information of interest about the target comprising the determination of an edge of at least a portion of the target. The invention is broken down into parts using hindsight to allow the invention to be read on the individual teachings the Office identified. This methodology completely ignores the field of art and the state of mind of an individual in the field of art at the time of the invention. Applicant contends that this analysis relies on hindsight and is wrong.

Applicant is not merely claiming the ability to observe an object under visible light and ultraviolet light. Applicant claims extracting information about the determination of an edge of a target based on processing a visible light image and an ultraviolet light image. Takeuchi and Kita do not relate to edge detection of non-microstructures observed by Applicant's machine vision system. While the combination of (Kley and Kubisiak) or (Kley and Ausschnitt) does relate to dimensional determination of an object, Kley, Kubisiak, and Ausschnitt provide no suggestion of

using ultraviolet light. In fact, Kley teaches away from using ultraviolet light. Neither Takeuchi nor Kley provide a motivation to combine in the manner asserted in the Office Action.

While arguably using different light sources at different frequencies to observe an object provides a wide-ranging field of art that relate Takeuchi and Kley. It is not "the similarities between references" that is the standard for combining references--the standard is that there must be motivation to combine the references. Here, there is none. There is not a single cite or reference (no finding) to a factor that could create a motivation to combine the references. The mere fact that Kley teaches using different colors of light within the visible spectrum does not suggest that all frequency of electromagnetic energy could be used. Accordingly, there is no *prima facie* basis to find a motivation to combine the references. Additionally, the rationale for combining the references is quite thin, is not based on a motivation to combine the references, and seems to in all cases be fabricated in hindsight solely for the purposes of combining the references. Accordingly, the combination of Takeuchi and (Kley and Kubisiak) or (Kley and Ausschnitt) is not proper, and any rejections based on this combination should be withdrawn.

Clearly the references are not combinable, and any rejections based on their combination under 35 USC §103 should be withdrawn,

the claims should be allowed, and their allowance is hereby requested. Neither U.S. Patent 3,710,128 to Kubisiak et al., U.S. Patent 5,914,784 to Ausschnitt et al., nor other references cited in the Office Action cure the above deficiencies.

B. Claim 22 is patentably distinguishable over the Takeuchi in view of Kley in view of Kubisiak in view of Murnaghan

In addition to the deficiencies cited in section A, claim 22 claims at least one filter disposed between the target and the second illumination source wherein the filter blocks wavelengths of light greater than 390 nanometers. The Office provides no teachings regarding the structure of an ultraviolet filter positioned between the target and the second illumination source. The Office provides a motivation for not combining the teaching of Murnaghan, i.e. causing a hazy look and protecting expensive lens from ultraviolet light, but provides no motivation for combining the teaching of Murnaghan. In addition to a lack of motivation, Murnaghan provides a structure of the filter positioned between the camera and the target, not the illumination source and target. The Office provides neither a motivation nor the proper structure as claimed. Therefore, the rejection of claim 22 with regard to Takeuchi in further view of Kley in further view of Kubisiak in further view of Murnaghan does not

render claim 22 obvious under U.S.C. § 103(a).

C. Claims 25-26 are patentably distinguishable over the Takeuchi view of Kley in view of Kubisiak in view of Schneider

In addition to the deficiencies cited in section A, claims 25-26 claim at least one filter disposed between the target and the camera wherein the filter blocks wavelengths shorter than 410 nanometers. The Office relies on Schneider for the teaching of a filter that blocks wavelengths shorter than 410 nanometers. Schneider is directed towards filming for motion pictures and television. Schneider UV-410 filter is for filming in atmospheric conditions containing heavy concentrations of dust particles, water droplets, and pollution. Schneider's filter is used to reduce haze during filming of outdoor environments due to air pollution. Schneider illustrates use of the filter by showing a skyline of a metropolitan area with and without the filter. Applicant submits that Schneider is non-analogous art. Applicant's machine vision system operates in an indoor laboratory environment suitable for manufacture of Printed Circuit Boards. Applicant's vision system is not concerned with the haze produced from outdoor pollution over the skyline of the city. One of skill in the art at the time of the invention would not have considered the teachings of Schneider for indoor, laboratory conditions.

Therefore, the rejection of claims 25-26 with regard to Takeuchi in further view of Kley in further view of Kubisiak in further view of Schneider does not render claims 25-26 obvious under U.S.C. § 103(a).

Respectfully submitted,

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APPENDIX

Claims Appendix

In the Claims:

15. A system comprising

a camera;

a first visible spectrum illumination source;

at least a second ultraviolet spectrum illumination source; and

a computer, connected to the camera, to receive an image from the camera, wherein the camera is capable of taking a first image of a target illuminated by at least the first illumination source, and further capable of taking a second image of the target illuminated by at least the second illumination source and wherein the first and second images are able to be analyzed in the computer to determine an edge of at least a portion of the target.

16. The system of claim 15 wherein the camera comprises a video camera.

18. The system of claim 15 wherein the analysis by the computer comprises superposition of the first image and the second image.

19. The system of claim 15 wherein the first illumination source comprises a diffuse on axis light source.

21. The system of claim 15 further comprising at least one filter disposed between the target and the second illumination source, which filter blocks visible light.

22. The system of claim 21 wherein the filter blocks wavelengths of light greater than 390 nanometers.

23. The system of claim 15 further comprising at least one filter disposed between the camera and the target.

24. The system of claim 23 wherein the filter blocks ultraviolet light.

25. The system of claim 24 wherein the filter blocks light with a wavelength shorter than 410 nanometers.

26. The system of claim 25 wherein the filter blocks at least one portion of the visible spectrum.

27. A method comprising:

providing a camera connected to a computer having storage, an input to receive at least first and second images and an output providing extracted image information;

providing a filter disposed between the camera and the target, which filter blocks ultraviolet light;

using the camera to obtain a first image of the target and sending the image to the computer while the target is illuminated by a first visible spectrum illumination source comprising a diffuse on-axis light;

using the camera to obtain a second image of the target and sending the image to the computer while the target is illuminated by at least a second illumination source comprising an ultraviolet light; and

using the computer to analyze the first and second image to extract information about the target to determine an edge of at least a portion of the target.

28. A method comprising:

providing a camera connected to a computer having storage, an input to receive at least a first image, a second image, and an output providing extracted image information;

providing a visible light filter disposed between the camera and the target, which visible light filter blocks visible light;

providing an ultraviolet light filter disposed between the camera and the target, which ultraviolet light filter blocks ultraviolet light;

using the camera to obtain a first image of the target and sending the image to the computer while the target is illuminated by a first illumination source comprising an ultra-violet light and the visible light filter is provided;

using the camera to obtain a second image of the target and sending the image to the computer while the target is illuminated by said first illumination source and the ultraviolet light filter is provided; and

using the computer to analyze the first image and the second image to extract edge information about the target.

29. A system comprising

a camera;

a first target illumination source comprising a visible light source;

a second target illumination source comprising an ultra-violet light source;

a filter disposed between the camera and said target; and

a computer, connected to the camera, to receive an image from the camera, wherein the camera is capable of taking at least first image of said target illuminated by said ultraviolet light source and second image of said target illuminated by said visible light source, and wherein the first image and second image are able to be analyzed in the computer to extract dimensional information about the target.

Evidence Appendix

None

Related Proceedings Appendix

None